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The present work is dedicated to the description of the pseudo-binary Al_2O_3-Bi_2O_3 and the isothermal section at 600°C of the system Al_2O_3-Bi_2O_3-PbO according to a Calphad approach. It takes part of the complete description of the complex system Pb-Bi-Fe-(Al,Cr)-O. Such study is of high interest for the nuclear community that aims to develop protective coatings for the MEGAPIE spallation target to prevent the T91 steel from corrosion due to contact with lead-bismuth eutectic liquid.

A survey in literature has revealed a discrepancy between equilibrium phases diagrams related to the Al_2O_3-Bi_2O_3 system where four different compounds were reported. Therefore, an experimental reinvestigation of the system was necessary. Samples were prepared from mixtures of powders of high purity at different compositions then annealed at different temperatures. Different techniques were used to characterize the samples: XRD, SEM (EDS and WDS) and DTA. Only two stoichiometric compounds were found to be stable at low temperature, and invariant transformations were determined. The same process was used in case of addition of PbO. A modeling of the binary is also proposed.